2012

Projecting into the Future: the Canadian Arctic Environment, Tomorrow to 2100

Barber, David G.

Pienitz,R., Lemay, M., Michaud, J., Blasco, K. and Veillette, J. (Eds), Impacts of Environmental Change in the Canadian Coastal Arctic: A Compendium of Research Condocted During ArcticNet Phase I (2004-2008),Volume 2, 256pp. An:ticNet inc.,

4.1 Projecting into the Future: the Canadian Arctic Environment, Tomorrow to 2100

Summary

Project Leader(s)
Barber, David G.

Model projections, our best means of estimating future weather and sea ice conditions, suggest, should the present observed warming continue, that as early as 2050 an ice-free arctic can be expected at the summer minimum (Flato and Boer, 2001). This projection, evaluated in light of changes observed by northerners over the past three decades, has fuelled an increasing interest in polar science and research studies to be conducted during International Polar Year. In project 4.1 the goal is not to reproduce previous investigations, but rather to improve on the credibility and utility of Arctic climate model results by: 1) employing novel means of evaluating model performance over the ArcticNet focus regions, and 2) developing means to integrate the arctic modelling community with process scientists, northern residents, and decision makers (at all levels of government from hamlet to hemispheric). Project 4.1 will focus on expanding existing partnerships and integrating labs with proven excellence in modeling into the broad focus areas of ArcticNet. The project will focus on four regional scale models: Baffin Bay (Tang), Beaufort Sea (Maslowski), Canadian Archipelago (Holland), and Hudson Bay (Saucier). These models are high-resolution coupled ocean-sea ice-atmosphere models that will examine marine and coastal processes to investigate how changes in the sea ice regime may affect people. In addition, two hemispheric/regional scale modeling efforts will also be supported in project 4.1: a) statistical downscaling of the Canadian Centre for Climate Modeling and Analysis (CCCMA) General Circulation Model (GCM) to drive a regional scale model of the Canadian Arctic Archipelago (UVic) and b) the MM5 regional scale model to examine climate surface coupling of terrestrial, coastal and sea ice regions (Hanesiak and Barber). These larger scale models will be used to examine the context of regional climate change relative to hemispheric and global scale changes under various climate change scenarios. Selected outputs from the model datasets will be archived and made available to the broader ArcticNet community.

People

Network Investigators
Barber, David G. (University of Manitoba)
Flato, Gregory (University of Victoria)
Hanesiak, John (University of Manitoba)
Saucier, François
Snelgrove, Ken (University of Manitoba)
Tang, Charles (Fisheries and Oceans Canada - Bedford Institute of Oceanography)

Collaborators & Research Associates
Holland, David (Courant Institute of Mathematical Sciences)
Maslowski, Wieslaw (Naval Postgraduate School)

Post-Doctoral Fellows
Huang, Qiang (University of Manitoba)
Walker, Ryan (University of Manitoba)

PhD Students
Bhuyian, A.K.M. (Hassan) (University of Manitoba)
Jin, Xin (University of Manitoba)
Joly, Sylvain (Université du Québec à Rimouski)
Konig, Chris (New York University)
St-Laurent, Pierre (Institut des sciences de la mer de Rimouski)

Masters Students
Fisico, Teresa (University of Manitoba)
Sou, Tessa (University of Victoria)

Project Staff
Anderson, Jay (University of Manitoba)
Dumas, Jacqueline (University of Victoria)
Dupont, Frédéric (Québec-Océan)
Liu, George (University of Manitoba)

Partners

Centre for Earth Observation Science (CEOS)
University of Victoria
Naval Postgraduate School
Fisheries and Oceans Canada - Bedford Institute of Oceanography
Université du Québec à Rimouski
A.D. Latornell Endowment Fund
Institut des sciences de la mer de Rimouski
Meteorological Service of Canada, Prairie Monitoring Group
Environment Canada - Meteorological Service of Canada
The National Science Foundation
New York University
Canada Economic Development
University of Manitoba

Publications

Articles Published in Refereed Publications

Wang, J., Liu, Q., Jin, M., Ikeda, M., Saucier, F., 2005, A coupled ice-ocean model in the Pan-Arctic and North Atlantic Ocean: Simulation of Seasonal Cycles, Journal of Oceanography, v61 (no. 2), 213-233, Published

Dethloff, K., Rinke, A., Morrison, H., Dorn, W., Gerdes, R., Maslowski, W., Kattsov, W., Lange, M., Goergen, K., and Lynch, A., 2005, Global impacts of Arctic climate processes, EOS Transactions, 513-4, Published

Proshutinsky, A., Wang, J., Krishfield, K., Gerdes, R., Karcher, M., Kauker, F., Maqueda, M., Holloway, G., Hunke, E., Maslowski, W., Steele, M., and Zhang, J., 2005, Arctic Ocean Study: Synthesis of Model Results and Observations, EOS Transactions, Vol. 86, No. 40, 368-71, Published

Clement, J.C., Maslowski, W., Cooper, L.W., Grebmeier, J.M., and Walczowski, W., 2005, Ocean circulation and exchanges through the northern Bering Sea – 1979-2001 model results, Deep Sea Research II, 52, 3509-40, Published

Walsh, J.J., Dieterle, D.A., Maslowski, W., Grebmeier, J.M., Whitledge, T.E., Flint, M., Sukhanova, I.N., Bates, N., Cota, G.F., Stockwell, D., Moran, S.B., Hansell, D.A., and McRoy, C.P., 2005, A numerical model of seasonal primary production within the Chukchi/Beaufort Seas, Deep-Sea Research II, 52, 3541-68, Published

Moran, S.B., Kelly, R. P., Hagstrom, K., Smith, J. N., Grebmeier, J.M., Cooper, L.W., Cota, G. F., Walsh, J.J., Bates, N.R., Hansell, D. A., Maslowski, W., Nelson, R., Mulsow, S., 2005, Seasonal changes in POC export flux in the Chukchi Sea and implications for water column-benthic coupling in Arctic shelves, Deep-Sea Research II, 52, 3427-51, Published

Kwok, R., Maslowski, W., and Laxon, S. W., 2005, On large outflows of Arctic sea ice into the Barents Sea, Geophys. Res. Lett.,32, L22503, Published

E.Dunlap and C.C.L. Tang, 2006, Modeling the mean circulation of Baffin Bay, Atmosphere-Ocean, 44, 99-110, Published

Uotila, P., Holland, D.M., Maqueda, M.A.M., Hakkinen, S., Holloway, G., Karcher, M., Kauker, F., Steele, M., Yakovlev, N.,Zhang, J., Proshutinsky, A. , 2006, An energy-diagnostic intercomparison of coupled ice-ocean Arctic models, Ocean Modelling, 11 (1-2), 1-27, Published

Dumas, J.A., Flato, G.M. and Brown, R.D., 2006, Future Projections of Landfast Ice Thickness and Duration in the Canadian Arctic, Journal of Climate, v19, no. 20, 5175-89, Published

Trites, A.W., Miller, A.J., Maschner, H.D.G., Alexander, M.A., Bograd, S.J., Calder, J.A., Capotondi, A., Coyle, K.O., Di Lorenzo, E., Finney, B.P., Fritz, L., Gregr, E.J., Grosch1, C.E., Hare, S.R., Hunt, G.L., Jahncke, J., Kachel, N.B., Kim, H.-J., Ladd, C., Mantua, N.J., Marzban, C., Maslowski, W., Mendelssohn, R., Neilson, D.J., Okkonen, S.R., Overland, J.E., Reedy-Maschner, K.L., et al., 2006, Bottom-up forcing and the decline of Steller sea lions (Eumetopias jubatus) in Alaska: assessing the ocean climate, Fisheries Oceanography, V16, no. 1, 46-67, Published

Rinke, A., Maslowski, W., Dethloff, K., and Clement, J.L., 2006, Influence of sea ice on the atmosphere: A study with an Arctic regional climate model, JGR- Atmospheres, V111, D16103, 1, Published

Lipscomb, W.H., Hunke, E.C., Maslowski, W., and Jakacki, J., 2007, Improving Ridging Schemes for High-Resolution Sea Ice Models, J. Geophys. Res., 112, C03S91, doi:10.1029/2005JC003355, 1, Published

Konig Beatty, C., Ahmed, A. and Holland, D.M. , 2007, A Climatology and Analysis of Arctic Landfast Sea-Ice Data, Atmosphere-Ocean, 1, Submitted

Holland, D.M., 2007, A 1-D elastic–plastic sea-ice model solved with an implicit Eulerian–Lagrangian method, Ocean Modelling V16, 1, 1-27, Submitted

Walker, R. and Holland., D.M. , 2007, A two-dimensional coupled model for ice shelf - ocean interaction, Ocean Modelling, 1, Accepted

Dumas, J.A., Melling, H., and Flato, G.M. , 2007, Late-summer pack ice in the Canadian Archipelago: Thickness observations from a ship in transit, Atmosphere-Ocean, V45, No. 1, 1, Published

Harvey M, Starr M, Therriault JC, Saucier FJ, and Gosselin M, 2007, MERICA-Nord Program: Monitoring and research program in the Hudson Bay complex, AZMP Bulletin PMZA 5, 27-32, Published

Straneo F, and Saucier FJ, 2007, The Arctic-Sub Arctic Exchange through Hudson Strait, Deep Sea Research, 1, Submitted

Sedlacek, J., Lemieux, J.F., Mysak, L.A., Tremblay, B., and Holland D.M. , 2007, The granular sea-ice model in spherical coordinates and its application to a global climate model, J. Climate, 1, Submitted

Straneo F and Saucier FJ , 2007, The Outflow from Hudson Strait into the Labrador Sea, Proceeding of the ASOF Conference, 2006, Arctic/Subarctic Ocean Fluxes, Submitted

Sou, T. and Flato, G.M., 2007, Sea ice in the Canadian Arctic Arctic Archipelago: Modelling the past (1950-2004) and the future (2041-2060), Journal of Climate, 1, Submitted

Other Refereed Contributions

Willmott, A., D.M. Holland, M.A.M. Maqueda, 2005, Polynya Modeling, Polynyas: Windows into Polar Oceans. Eds. W.O. Smith and D.G. Barber, 1, Accepted

Non-Refereed Contributions

Flato, Gregory M. and Jacqueline Dumas, 2004, Modelling Landfast Ice in the Canadian High Arctic, Proceedings ArcticNet 2004 Annual Scientific Meeting, 9, Accepted

Sou, T., Flato, G., 2005, Modelling the Flow and Variability of Ice through the Canadian Archipelago, 2005 ArcticNet Annual Conference Proceedings, 97, Published

Sibert, V., Zakardjian, B., Saucier, F.J., Chifflet, M., 2005, A 3-D model of ice-algae and plankton dynamics under seasonally ice-covered sub-Arctic environment, 2005 ArcticNet Annual Conference Proceedings, 80, Published

Defossez, M., Saucier, F.J., Myers, P.G., and Caya, D., 2005, Observation and simulation of deep water renewal in Foxe Basin, 2005 ArcticNet Annual Conference Proceedings/ 2005 American Geophysical Union Fall Meeting, San Francisco, 48, Published

Dumas, J. and Flato, G., 2005, Conditions Leading to Sikussak Ice: A Study of the Ward Hunt Ice Shelf, 2005 ArcticNet Annual Conference Proceedings, 50, Published

Mei, S.-P., Zakardjian, B., Saucier, F.J., Senneville, S., Azetsu-Scott, K., Gosselin, M., and Xie, H., 2005, A 3-D coupled physics-CO2 flux model of the Hudson Bay system: A Dark Ocean Experiment, 2005 ArcticNet Annual Conference Proceedings, 80, Published

Huang, Q., Hanesiak, J., Savelyev, S., Papakyriakou, T. and Taylor, P., 2005, Visibility during blowing snow events at Churchill, MB, 2005 ArcticNet Annual Conference Proceedings, 1, Published

Tang, C., Ross, C., Yao, T., Petrie, B., DeTracey, B. and Dunlap, E., 2005, Circulation, sea-ice and water masses of Baffin Bay, 2005 ArcticNet Annual Conference Proceedings, 99, Published

Garrett, C., Sutherland, G., Arbic, B., St-Laurent, P., and Saucier, F.J., 2006, The (Second?) Highest Tides in the World, 2006 Ocean Sciences Meeting, Honolulu, 1, Accepted

St.-Laurent, P., Defossez, M., Saucier, F.J., Straneo, F., Senneville, S., and Dumais, J.-F., 2006, New observations and numerical simulations of the sea ice-ocean seasonal cycle in Hudson Bay, Foxe Basin and Hudson Strait, 2006 Ocean Sciences Meeting, Honolulu, 1, Published

Anderson, J., Barber, D., 2007, The ArcticNet IRIS modeling Scenarios (Aims) Database - Where Do We Go from Here, 2007 ArcticNet Annual Conference Proceedings, 17, Published

Hannah, C., Dupont, F, Dunphy, M., 2007, Polynyas and Tidal Currents in the Canadian Arctic Archipelago, 2007 ArcticNet Annual Conference Proceedings, 22, Published

Zhuo, L., Hanesiak, J., Goodson, R., Stewart, R., 2007, Evaluation of Gem-Lam Over Southern Baffin Island, 2007 ArcticNet Annual Conference Proceedings, 26, Published